

REMARKS

The Office Action dated May 4, 2007 has been carefully reviewed and the claims amended. Claims 1 and 21 have been amended in response to the Examiner's rejections as described below. Claims 10, 18, 20, and 30 were amended to correct typographical errors. Claim 32 was amended to correct typographical errors and to correct the number of the claim upon which it depends. Claims 25, 35, and 36 were amended to correct the number of the claim upon which they depend. Claims 37, and 38 were amended because an additional step was inserted in the method claim 21. Claims 2-4 and 22-24 have been canceled.

Claim Rejections – 35 U.S.C. §112

The Examiner rejected claims 1-46 under 35 U.S.C. §112, second paragraph, as being indefinite. Specifically, the Examiner states that a 'region of interest' can be interpreted as either 2-D or 3-D, and no 3-D structure is claimed. Additionally, the Examiner states that no voxel assemblage structure such as a volume memory is claimed.

With respect to the volume memory, claims 1 and 21 have been amended to include a memory element.

With respect to the 2-D or 3-D structure, the present invention can be used to produce a measurement of either 2-D or 3-D structures which are simple variants of each other, both which would be understood from an explanation of either one of these variants. For example, if one can measure the elastic properties of tissue in a plane (two dimensions) then simply repeating this process with slight displacements perpendicular to the plane provides the elastic properties in three dimensions. As stated in the published specification at paragraph [0053]:

[F]or reasons of clarity, the invention has been described with respect to voxels 26 aligned in a single plane corresponding to a plane of the image produced on graphic display 32. However, it will be understood the essential principle of summing together the echo signals taken at different angles to improve elastography measurements may occur by moving the ultrasonic transducer 12 so as to collect multiple ultrasonic beams that differ not only by their angle within the plane but also in angles over a three-dimensional curved surface so as to produce a volumetric image data that may be displayed one slice at a time or rendered as a three-dimensional object.

Accordingly it is believed both that the inventor had possession of the invention applied to two-dimensional and three-dimensional regions of interest and this was adequately disclosed in the application.

While the claim is broader than a claim limited to one or other of these variants, according to MPEP 2173.04, breadth of a claim is not to be equated with indefiniteness.

Applicant believes that in light of the amendments to claims 1 and 21 to add a memory device, the rejection under 35 U.S.C. § 112 has been overcome.

Claim Rejections – 35 U.S.C. § 102

The Examiner rejected claims 1-7, 13-27, 31, and 33-46 under 35 U.S.C. §102(b) as being anticipated by Lin (U.S. 6,068,597). Lin discloses a method and apparatus for vibrational resonance ultrasonic Doppler spectrometry. Lin further discloses that a multi-channel ultrasonic transducer is used (col. 4, line 34). Lin indicates that a beamformer 128 is used to convert the multi-channel input from the transducer into a single signal (col. 4, lines 33-38). These individual signals are then digitally processed and stored, along with coordinate information, to determine vibrational resonance that is a function of an elastic force constant (col. 6, lines 53-60).

The multichannel ultrasonic transducer of Lin makes multiple echo measurements from different angles and combines those echo measurements to provide a focused echo measurement using phased array techniques. Thus, the unamended claims 1 and 21 arguably but inadvertently read on Lin. Accordingly independent claims 1 and 21 have been amended to indicate that strain is calculated from echo measurements at each angle and then two strains measurements at different angles are compounded to produce a compounded strain measurement along a given angle. This has been done by incorporating the limitations of claims 2 and 3 into claim 1 and the limitations of claims 22 and 23 into claim 21.

In contrast, Lin combines the echo measurements along different angles to produce a single focused echo measurement (using the beam former 128) and then this single echo measurement is used to produce a single elasticity measurement. See generally column 4, lines 33-39.

While this appears to be a minor difference, it is fundamental with respect to the data actually obtained by Lin, which does not combine two strain measurements taken at different angles to achieve the noise reduction benefits of the present invention described generally at paragraph [0012] of the published specification. Because Lin combines the raw ultrasound measurements from the different angles before extraction of any strain, the benefits of two independent strain measurements are lost.

Accordingly the Applicant believes that the rejection of amended claims 1 and 21 under §102 has been overcome by this amendment.

Claim Rejections – 35 U.S.C. § 103

The Examiner rejected claims 8-12, 28-30, and 32 as being unpatentable under 35 U.S.C. §103 over Lin (U.S. 6,068, 597) in view of Ueki et al. (U.S. 6,377,656 B1). This rejection applies to claims 3 and 23 incorporated into the independent claims 1 and 21 as described above.

In order for a claim to be obvious, MPEP 2143.03 requires that, "all the claim limitations must be taught or suggested by the prior art." The Examiner notes that Lin fails to teach the use of a varying weighting function to estimate Poisson's ratio. However, this is also true with Ueki, which, as noted by the Examiner, teaches a weighting function but not a weighting function to estimate Poisson's ratio. The weighting function in Ueki is used to correct a histogram of an x-ray image and thus neither suggests nor enables a combination of ultrasonic signals at different angles to produce a combined strain measurement. The fact that both the present invention and Ueki use the terms "weighting function" would not be sufficient to suggest the different particular functions or their different application to one of ordinary skill in these arts.

In addition, and as noted above, Lin does not teach combining strain measurements made at two angles into a single strain measurement. Ueki does not remedy this deficiency in Lin.

Thus, even in combination, Lin and Ueki fail to teach the elements required of the 8-12, 28-30, and 32.

In light of these remarks and amendments, it is believed that claims 1, 5-21, 25-46 are in condition for allowance and allowance is respectfully requested.

Respectfully submitted,

By. 

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